ANALYSIS OF CONTRIBUTING FACTORS TO OBESITY IN CHILDREN AND ADOLESCENTS IN SOUTHWEST GEORGIA

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Analysis of contributing factors to obesity in children and adolescents in southwest Georgia

by
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Abstract

Today more than 23 million U.S. children and adolescents are either obese or overweight. Hospital costs from obesity-related diseases in youth have increased from $35 million (0.43% of total hospital costs) during 1979 to 1981 to $127 million (1.79% of total costs) during 1997 to 1999. During the Pathway to Med School program, I collaborated with three other students to develop a research project on childhood and adolescent obesity. We conducted surveys at nine different primary care clinics in the southwest Georgia area. Approval was sought by the Institutional Review Board of Phoebe Putney Memorial Health System and Albany Area Primary Health Care. A total of 71 children and adolescents ages two to 18 were surveyed. I analyzed the data using chi-square, 2-way ANOVA, and 1-way ANOVA testing for significant relationships between body mass index and daily screen time, daily physical activity, and other variables. A relationship and significant difference was found in comparing body mass index between males and females. The males had a significantly higher BMI than the females. No relationship was found between daily screen time and body mass index, daily physical activity and body mass index, or perception of weight between males and females. There was no significant difference between the body mass index of children and adolescents surveyed who have insurance and those who do not have insurance, and the body mass index was not significantly affected by the healthy foods eaten weekly. The results indicated that a relationship does exist between sex and body mass index.

Program Overview

The Pathway to Med School Program was started in 2004 by the Southwest Georgia Area Health Education Center in collaboration with Albany Area Primary Health Care Inc. and the Southwest Georgia Family Medicine Residency. The program consists of shadowing primary care physicians, performing practice-based community research, and attending seminars. In 2012, eight students were chosen to participate in the program. The Pathway program began June 25, 2012 and ended July 26, 2012. The first week was spent conducting surveys at nine different clinics in the southwest Georgia area. During the next four weeks, we shadowed physicians and analyzed the results of our surveys in order to develop a research project.

During the Pathway to Med School program, I collaborated with three other students to develop a research project on childhood and adolescent obesity. We conducted the surveys at nine different primary care clinics in the southwest Georgia area. Male and female children and adolescents ages 2-18 were surveyed. Parental approval was sought before any questions were asked.

Introduction

The prevalence of obesity in children and adolescents has increased substantially over the past several decades (Raj 2012). In 2004, the Center for Disease Control and Prevention cited that over 16 percent of children and adolescents in the U.S. ages six to 19 years of age were either overweight or obese. Childhood obesity is well known to result in significant morbidity and mortality (Raj 2012).

Children are considered individuals under the age of 13, and adolescents are ages 13-20. Obese children are classified as having a body mass index equal to or exceeding the age and

gender specific 95th percentile. Children with a BMI equal to or above the 85th percentile but not exceeding the 94th percentile are classified as being overweight. Childhood obesity generally persists into adulthood with up to 80% of obese children becoming obese adults (Cali and Caprio 2008).

The medical costs associated with childhood obesity are estimated to be around 71 billion dollars each year (Green et al 2012). Obesity in childhood is the most consistent predictor of heart disease in adulthood (Raj 2012). Recent studies have demonstrated that there is a particular obese phenotype that is linked to alterations in insulin sensitivity and cardiometabolic complications (Cali and Caprio 2008). Hospital costs from obesity-related diseases in youth have increased from $35 million (0.43% of total hospital costs) during 1979 to 1981 to $127 million (1.79% of total costs) during 1997 to 1999 (Schneider and Brill 2005). Obesity in childhood can also cause psychosocial problems. Girls reported more adverse social, educational, and psychological problems. Results from studies by Kosti and Panagiotakos (2006) showed that obese girls, when compared to counterparts of average weight, were 1.63 times less likely to associate with friends in the last week, 1.49 times more likely to report serious emotional problems in the last year, 1.79 times more likely to report hopelessness, and 1.73 times more likely to report a suicide attempt in the last year. Obese boys showed similar results when compared to average weight boys: 1.91 times less likely to associate with friends in the last week, 1.34 times more likely to feel that their friends do not care about them, 1.38 times more likely to report having serious problems in the last year, 1.46 times more likely to consider themselves as poor students, and 2.18 times more likely to expect to quit school (Kosti and Panagiotakos 2006).

In general terms, overweight is the result of an unbalance between the energy taken in and the energy expended (Smit et. al 2010). Children's Healthcare of Atlanta states that in 2012, nearly 40% of Georgia's children are classified as overweight or obese. This percentage accounts for the state of Georgia having the second worst rate of childhood obesity in the United States. A weight management program for children and adolescents resulted in decreased body weight, decreased body mass index and improved fitness (Eliakim et. al 2002). Hierarchical regression analyses indicated that video game use predicted body mass index in male teens (Ballard et. al 2009).

The main objective of this research was to analyze the relationships between body mass index and different variables associated with obesity. I hypothesized that a higher body mass index will be observed in female patients who participate in large amounts of screen time daily, receive fewer hours of physical activity daily, eat fewer healthy foods each week, and have no insurance.

Methods

Approval was sought by the Institutional Review Board of Phoebe Putney Memorial Health System and Albany Area Primary Health Care. Surveys were conducted under the direction of Southwest Georgia Area Health Education Center at the following clinics in Southwest Georgia: Dawson Medical Clinic, Lee Medical Arts Center, East Albany Medical Center, East Albany Pediatric Center, South Albany Medical Center, Phoebe Family Medical Center, Family Medical Associates at the Veranda, Family Medical Associates, and Southwest Georgia Family Medicine Residency. Over a one week period in June, 71 patients ages 2-18

were surveyed. This included 33 males and 38 females. Patients visiting the physician for any reason were surveyed, and siblings accompanying them were surveyed as well. A consent form was signed and dated by a parent or guardian for children under the age of 18. The survey questions were determined by the preceptor coordinator and student support coordinator for the internship. Questions from the survey were read aloud to each patient and explanations for the answer choices were given by the surveyor when necessary. Patient information including height, weight, body mass index, sex, and race was gathered from each survey participant's medical chart.

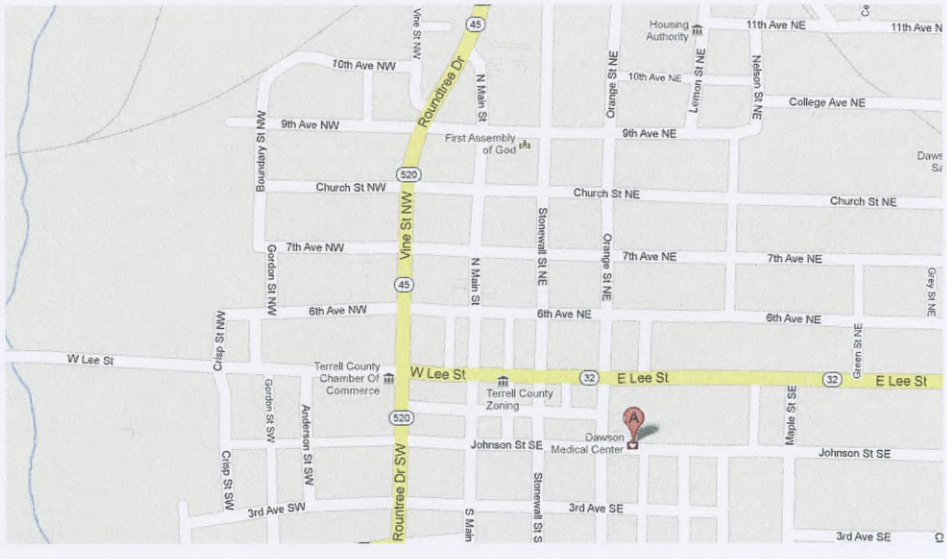

Figure 1. Dawson medical clinic

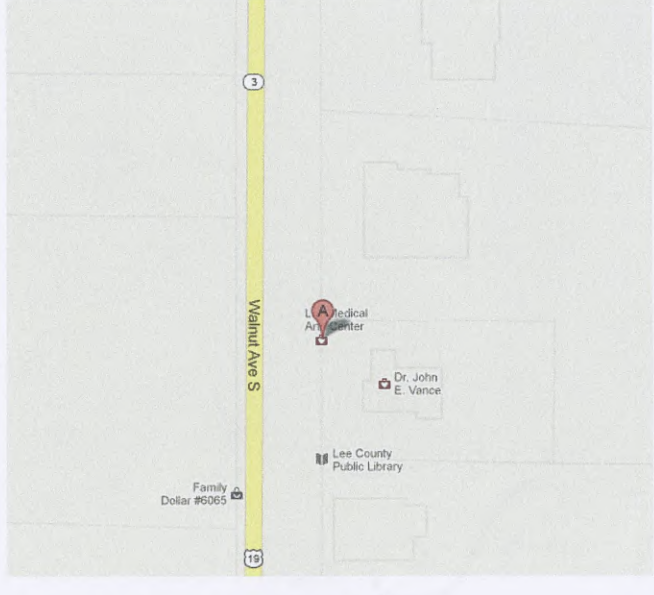

Figure 2. Lee Medical Arts Center

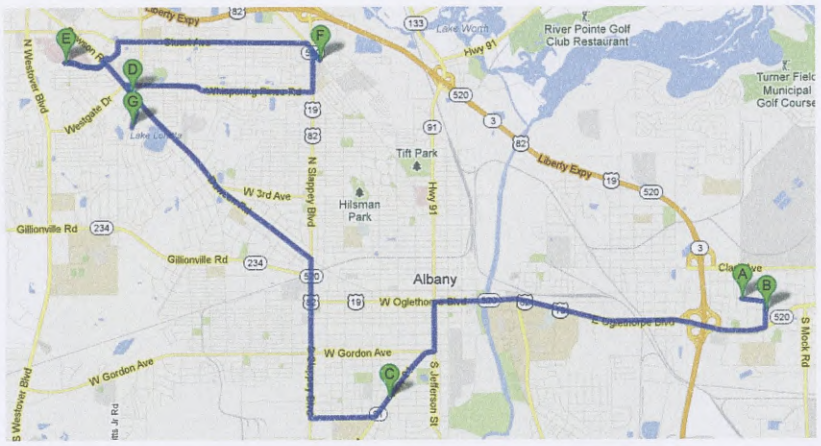

Figure 3. East Albany Medical Center, East Albany Pediatric Center, South Albany Medical Center, Phoebe Family Medical Center, Family Medical Associates at the Veranda, Family Medical Associates, and Southwest Georgia Family Medicine Residency

The data collected from the surveys was used in analysis looking at screen time, physical activity, and types of foods and drinks consumed by the patients. A chi-square test for independence was used to analyze the perception of weight and to test for a relationship between the perception of weight and the actual weight. This test was chosen since the variables under study were categorical. To analyze independent variables including daily physical activity, daily screen time, healthy foods eaten each week, and insurance 1-way ANOVAs and T tests were done to test for statistical significance. I also did 2-way ANOVAs to test for statistical significance between males and females across the chosen categories. The dependent variable was body mass index. A p-value < 0.05 was considered statistically significant.

Results

Perception of weight

Of the 71 individuals surveyed, 23% perceived themselves to be overweight. The percentage for underweight was 4%, and 73% perceived themselves to be at a normal weight (P=0.48).

Table 1. Male and female classifications for perception of body weight.

Perception of weight	Female	Male	Total
Underweight	1	2	3
Normal	30	22	52
Overweight	7	9	16
Total	38	33	71

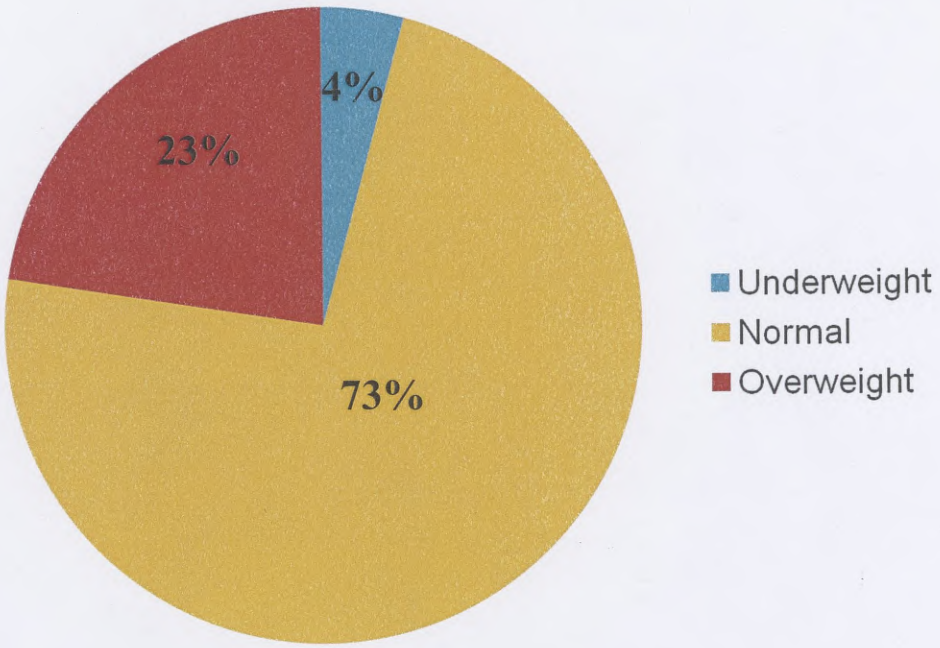

Figure 4. Percentages for perception of body weight as underweight, normal, or overweight.

Actual weight

Of the 71 children and adolescents surveyed, based on body mass index 7% were classified as underweight, 45% as being at a normal weight, 24% overweight, and 24% obese. A chi-square test was performed looking at the actual weight and perception of weight (P=0.01).

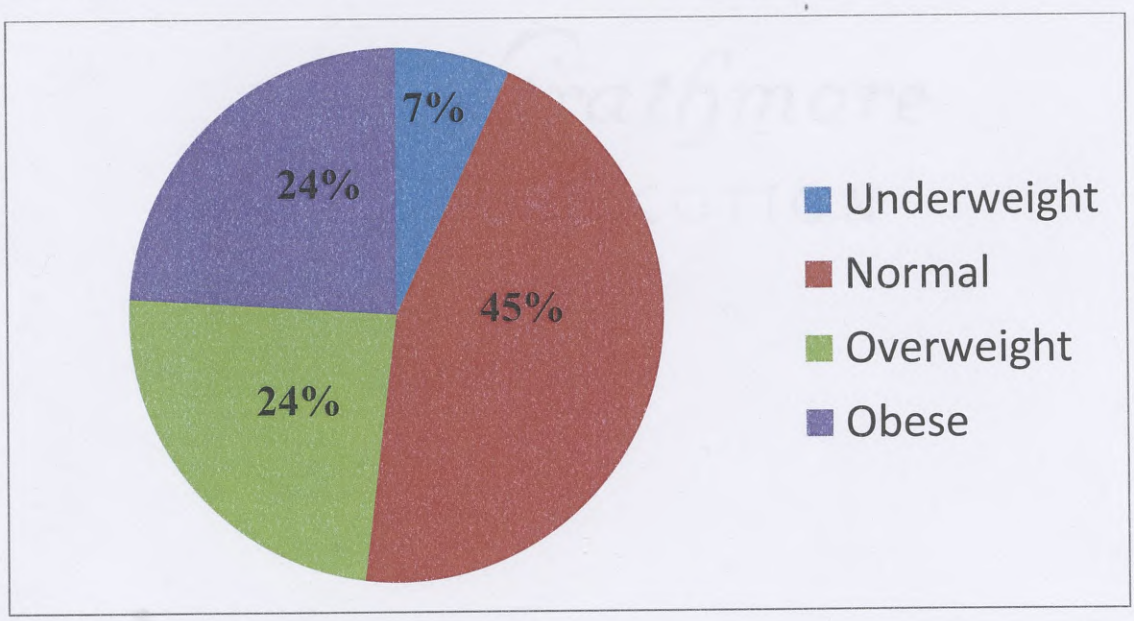

Figure 5. Pie chart showing percentages of children and adolescents classified as underweight, normal weight, overweight, and obese.

Body mass index in males and females

A significant difference was found in the average (+/-1S.E.) body mass index between males and females (1-way ANOVA, $F_{1,69}$=4.063, P=0.048).

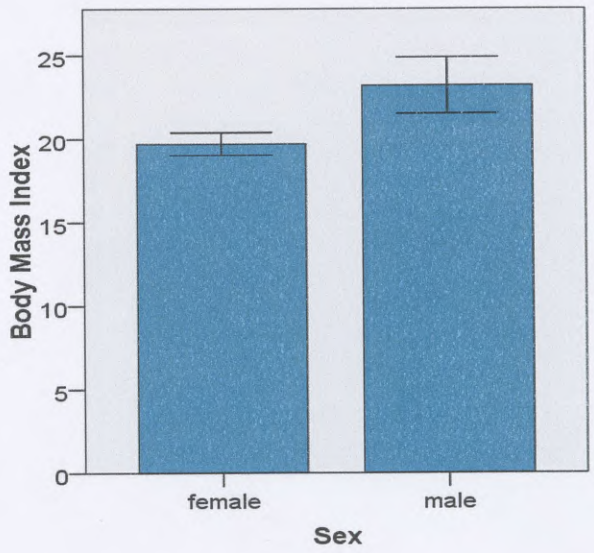

Figure 6. Differences in average (+/-1 S.E.) body mass index between males and females.

Daily screen time

No significant difference was found in the average (+/-1S.E.) body mass index across the four categories for daily screen time (1-way ANOVA, $F_{3,67}$=0.753, P=0.525).

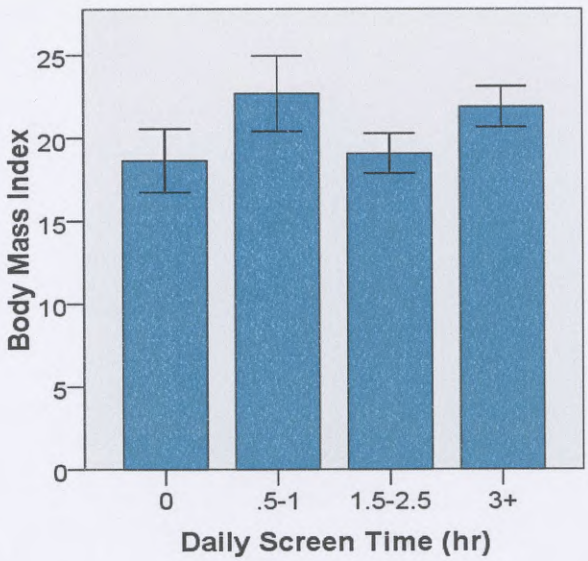

Figure 7. Differences in average (+/-1 S.E.) body mass index across varying daily screen times.

Daily physical activity

No significant difference was found in the average (+/-1S.E.) body mass index across the four categories for daily physical activity (1-way ANOVA, $F_{3,67}$=0.744, P=0.530).

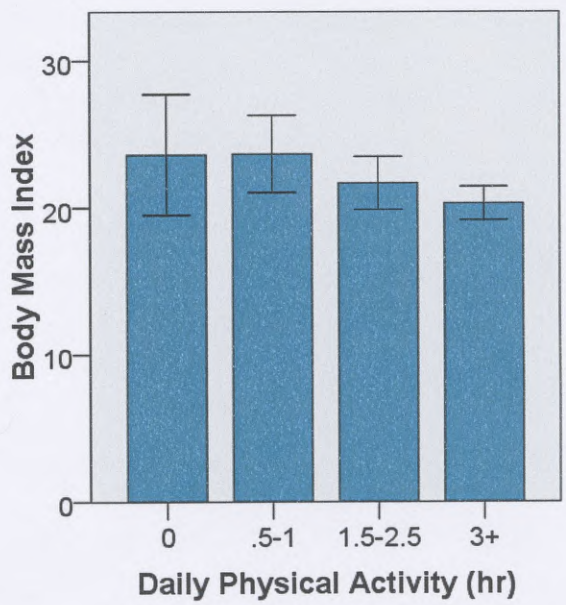

Figure 8. Differences in average (+/-1 S.E.) body mass index across varying daily physical activity times.

Insurance

No significant difference was found in the average (+/-1S.E.) body mass index between patients surveyed who have insurance and those who do not have insurance (1-way ANOVA, $F_{1,66}$=0.72, P=0.789).

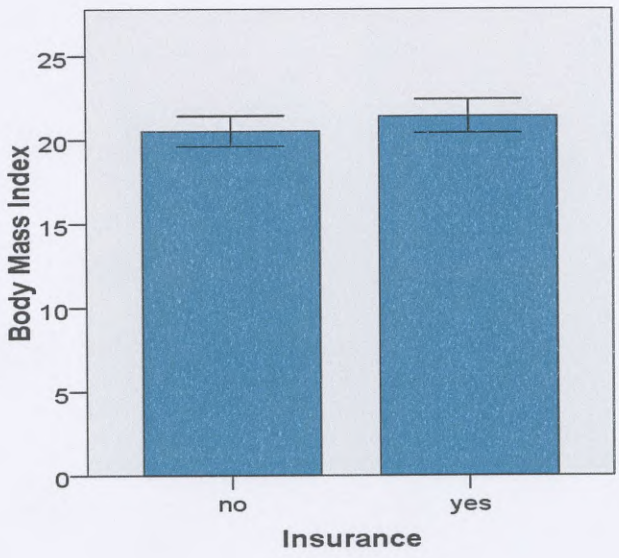

Figure 9. Differences in average (+/-1 S.E.) body mass index between patients with insurance and those without insurance.

Healthy foods eaten weekly

There was no significant difference in the average (+/-1S.E.) body mass index across the three categories for number of healthy foods eaten weekly (1-way ANOVA, $F_{2,61}$=0.903, P=0.411).

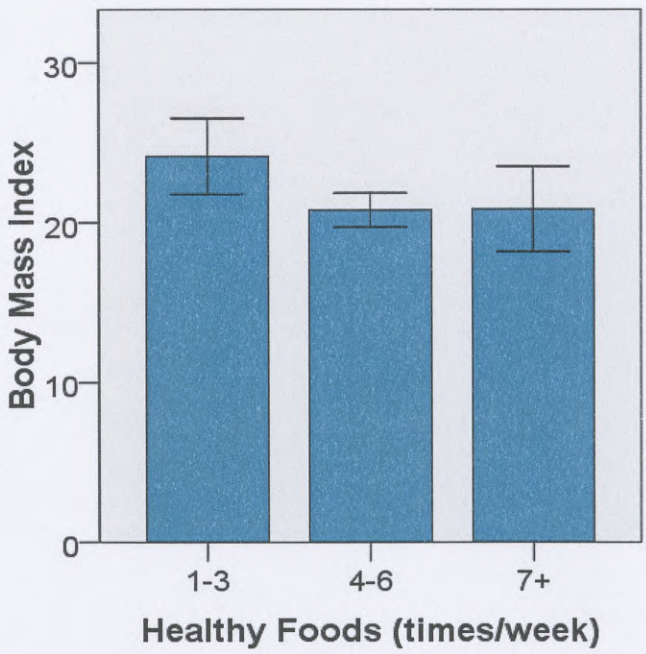

Figure 10. Differences in average (+/-1S.E.) body mass index across three groups for healthy foods eaten each week.

Discussion

After analysis of body mass index and variables associated with BMI, a significant difference was found in the average body mass index between males and females. While there was no relationship found in the perception of weight between males and females, there was a relationship between the actual weight and the perception of weight. No significance was found in analyzing the other variables of daily screen time, daily physical activity, healthy foods eaten weekly, or insurance.

The relationship found between the actual weight and perception of weight indicates that there are some individuals surveyed who are not aware of their actual weight. However, further analysis would need to be conducted in order to see where this relationship lies. A study on self-reporting body mass index in approximately 15000 teens found that obese teens do not usually accurately report their weight. In 44.2% of the instances of obese teens, neither the teen nor the parent reported obesity (Goodman, Hinden, and Khandelwal 2000). The relationships between screen time, physical activity, and dietary habits have been studied before, and it was found that these variables were not significantly related to body mass index (Laurson, Eisenmann, and Moore 2008).

The patients' answers to survey questions were influenced by the presence of a parent or guardian. In cases of very young children, the parent or guardian would answer all of the questions. The number of surveys also limited the study. This initially started as two separate

projects on adolescent obesity and childhood obesity separate. Due to the limited number of survey participants, the projects were combined. Four students collaborated together on this research while at the Pathway to Med School internship. In explaining the survey questions, our explanations were likely not identical. In order to receive the most accurate responses, the questions should be explained and elaborated on in a similar fashion by all of the surveyors.

In future studies, more surveys need to be taken. Adding more data to the analysis could significantly affect the results. It would also be interesting to do surveys in another area much different from southwest Georgia in order to see if there is a correlation between the results and the location. The relationship between the actual weight and perception of weight needs to be explored to see where the discrepancy is. This analysis would reveal if there are individuals who perceive themselves to be at a normal weight or underweight while they are in reality overweight or obese.

References

1. Ballard, M., Gray, M., Reilly, J., and Noggle, M. "Correlates of video game screen time among males: body mass, physical activity, and other media use." *Eating Behaviors* 10.3 (2009): 161-167.
2. Cali, Anna M.G., and Sonia Caprio. "Obesity in Children and Adolescents." The Journal of Clinical Endocrinology and Metabolism 93.11 (2008).
3. Daniels, Stephen R. "The Consequences of Childhood Overweight and Obesity." The Future of Children 16.1 (2006): 47-67.
4. Eliakim, Alon, Galit Kaven, Isaac Berger, Orit Friedland, Baruch Wolach, and Dan Nemet. "The effect of a combined intervention on body mass index and fitness in obese children and adolescents – a clinical experience." *European Journal of Pediatrics* 161.8 (2002): 449-454.
5. Goodman, Elizabeth, Beth R. Hinden, and Seema Khandelwal. "Accuracy Of Teen And Parental Reports Of Obesity And Body Mass Index." *Pediatrics* 106.1 (2000): 52.
6. Green, Gregory, Clarence Riley, and Brenda Hargrove. "Physical Activity And Childhood Obesity: Strategies And Solutions For Schools And Parents." *Education* 132.4 (2012): 915-920.
7. Henriette A. Smit, et al. "Diet, Screen Time, Physical Activity, And Childhood Overweight In The General Population And In High Risk Subgroups: Prospective Analyses In The PIAMA Birth Cohort." *Journal Of Obesity* (2010): 1-9.
8. Kosti, Rena I., and Demosthenes B. Panagiotakos. "The Epidemic of Obesity in Children and Adolescents in the World." Cent Eur J. Publishing Health 14.4 (2006): 151-159.
9. Laurson, Kelly, Joey C. Eisenmann, and Sylvia Moore. "Lack Of Association Between Television Viewing, Soft Drinks, Physical Activity And Body Mass Index In Children." *Acta Paediatrica* 97.6 (2008): 795-800.
10. Lytle, Leslie. "Dealing With The Childhood Obesity Epidemic: A Public Health Approach." *Abdominal Imaging* 37.5 (2012): 719-724.
11. Raj, Manu. "Obesity And Cardiovascular Risk In Children And Adolescents." *Indian Journal Of Endocrinology & Metabolism* 16.1 (2012): 13-19.

12. Reilly, J. J., and J. Kelly. "Long-Term Impact Of Overweight And Obesity In Childhood And Adolescence On Morbidity And Premature Mortality In Adulthood: Systematic Review." *International Journal Of Obesity* 35.7 (2011): 891-898.
13. Schneider, M.B., and S.R. Brill. "Obesity in Children and Adolsecents." Pediatrics in Review 26.5 (2005): 155-162.